POLICY RESEARCH WORKING PAPER

1813

Tackling Health Transition in China

Shaikh I. Hossain

After three decades of great improvements in China's health status, health gains have eroded recently. The three main causes of this have been changes in government financing of the health sector, the shift to a more market-oriented economy, and a shift toward more noncommunicable diseases and injuries, the prevention of which has not been a traditional part of China's public health programs.

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Summary findings

Over the past three decades, China has made commendable strides in improving the health status of its population. Between 1965 and 1995, its infant mortality rate declined from 90 per 1,000 live births to 36. During the same period, life expectancy at birth rose from 55 to 69 years and the maternal mortality rate fell from 26 to 15 per 100,000 deliveries.

This performance compares favorably with that in similar Asian economies. China's infant mortality rate, for example, was less than half the rate predicted for its income level. Similarly, life expectancy at birth was higher than that in many comparable Asian countries.

These favorable results conceal more recent trends, however. Since the early 1990s, mortality rates have increased in many provinces, particularly among infants and children under age five. And health status and health-related process indicators have improved more slowly than in the mid-1980s.

What accounts for relatively stagnant, even deteriorating health indicators, and what strategies should be designed to address them as China enters the 21st century? Overall, Hossain argues, the recent erosion in health gains stems from three factors:

- Changes in government financing of the health sector have increased inequity, inefficiencies, and costs for medical treatment.
- The main contributors to the burden of disease have shifted from maternal conditions and infectious diseases toward noncommunicable diseases and injuries, the prevention of which has not been a traditional part of China's public health programs.
- The shift to a more market-oriented economy has changed environmental and behavioral risk factors, thus diversifying the types of disease across regions.

Hossain suggests strategies for mitigating China's current and emerging health problems.

This paper — a product of the Rural and Social Development Division, China and Mongolia Department — appeared in an earlier version as chapter 2 of World Bank, "China: Social Sector Expenditure Review, 1996," China and Mongolia Department, Washington, D.C., 1996. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Clydina Anbiah, room T7-015, telephone 202-458-1275, fax 202-522-1778, Internet address shossain@worldbank.org. August 1997. (35 pages)

Tackling Health Transition In China

by

Shaikh I. Hossain

An earlier version of this paper appeared in Chapter 2 in,"China: Social Sector Expenditure Review, 1996". I am grateful to Jere Behrman, Jagadish Upadhyay and Nicholas Prescott for helpful comments. Comments from participants in a seminar held in Beijing are also appreciated.

Introduction

Over the period of three decades, China has made commendable strides towards improving the health status of its population. Between 1965 and 1995, China's infant mortality rate declined from 90 per 1,000 live births to 36, during the same period, life expectancy at birth rose from 55 to 69 years, and maternal mortality rate fell from 26 to 15 per 100,000 deliveries. When compared with similar Asian economies, China's performance has also been favorable as its infant mortality rate for example was less than one-half of the rate predicted for its income level (fig 1). Similarly, life expectancy at birth was higher than many Asian comparators (fig 2). These impressive gains in health status have been the direct products of the government's political resolve and imperative in the early 1970s, when the proliferation of public financed community and preventive health programs rapidly expanded access to basic health care and broadened its coverage.

However, these positive indicators conceal more recent trends. Since the early 1990s, mortality rates have increased in many provinces, particularly among infants and children younger than age 5. Moreover, the countries whose mortality rates among these two groups were already low in 1965--Malaysia, South Korea, Thailand and Sri Lanka--continued to show larger percentage declines in these indicators than did China. Likewise, these countries have showed larger percentage gains in average life expectancy and they have made greater progress in such process indicators as coverage for immunization and births attended by trained personnel (Annex 1, Table 1). In China itself, improvements in health status and health- related process indicators have been slower than similar advances made in the mid-1980s. What accounts for these relatively stagnant and sometimes deteriorating health indicators, and what strategies should be designed to address them as China enters 21st century? Overall, as this paper argues, the recent erosion in gains stems from three factors. One, changes in government financing for the health sector have created greater inequity, inefficiencies and raised the costs of medical treatment. Two, the major contributors to burden of disease have changed from maternal and infectious toward non-communicable diseases (NCD) and injuries, the prevention of which has not been a traditional part of public health programs (PHP), and three the shift to a more market oriented economy has changed environmental and behavioral risk factors, thus diversifying the types of disease across regions.

The paper has three sections. In section I, the current problems in health sector are discussed, while section II presents emerging health problems of China and the final section provides strategic directions to mitigate both current and emerging health problems of China.

Figure 1

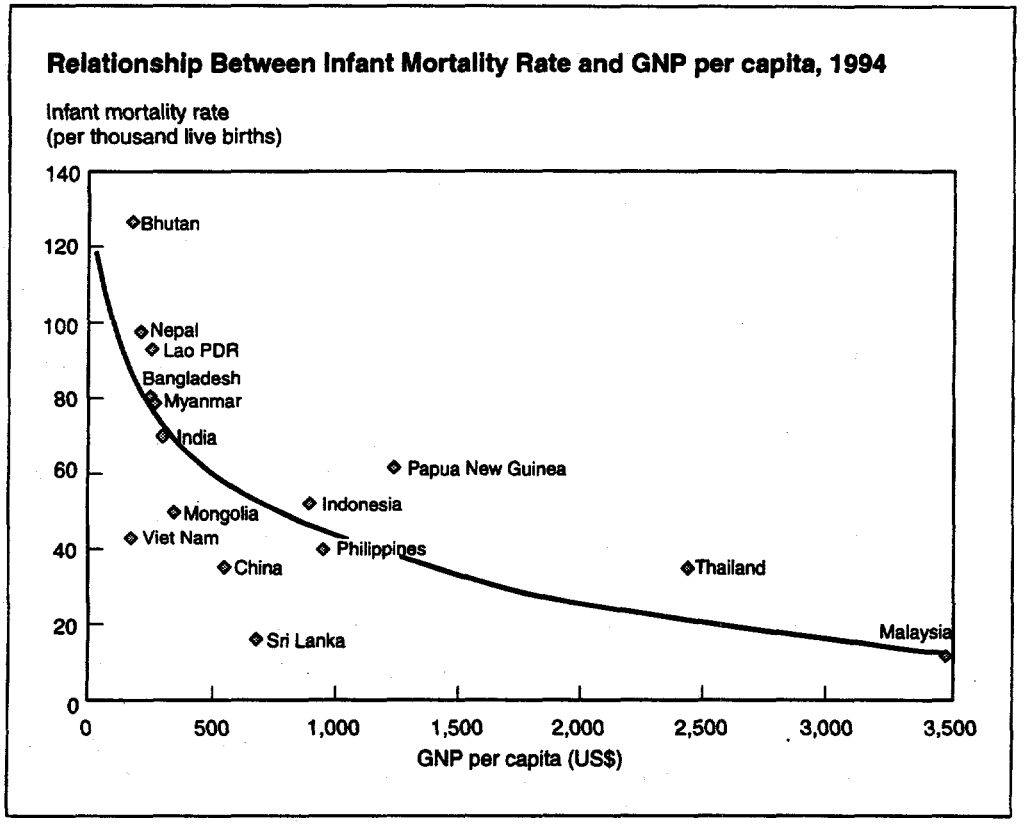
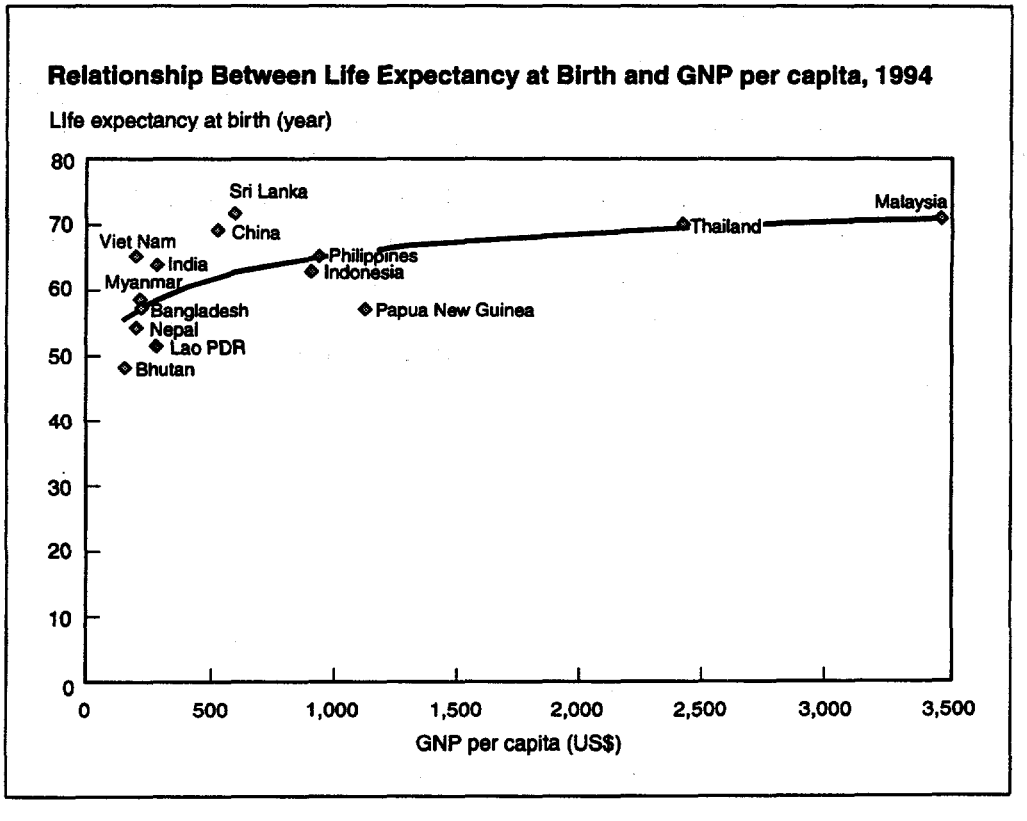


Figure 2



Current Problems

Equity

Regressive Public Health Expenditures: The figure 3 shows that public spending was pro-poor in 1980s, but has become increasingly regressive in the early 1990s--that greater health expenditures are made in richer provinces. A more instructive finding is that income and vital health indicators appear to have played a considerable role in budgeting decisions. Poor provinces, including Henan, Guizhou, Yunnan, and Jiangxi, in which infant mortality rates are higher than the national average, received meager budgetary resources and spent less. Contrary to pro-health risk targeting, poor and high infant mortality provinces--Hunan, Sichuan, and Guangxi--received considerably low health budgetary outlays. Chief outliers are Shangdong, Zhejiang, Liaoning, Tianjin, Beijing, and Shanghai, which have high per capita income, a low infant mortality rate, and high per capita health spending (fig 4).

During the same period, despite a rise in real government health spending, its fiscal effort for health has reduced, as evidenced by a steady decline in its spending as a percentage of GNP from 0.77 to 0.45. If the average spending levels in similar Asian economies are considered, then the fiscal effort for health in China is weaker (Table 2, Annex). Exacerbating this trend is the elimination of communal agriculture in the 1980s which dismantled the rural cooperative medical system, and those who had been covered under this scheme have been forced to pay for public health services. The growing share of patient fees and corresponding decline in the share of rural cooperative to total health cost attest to this fact (fig 5). To a large extent these episodes, as demonstrated below, gradually led to unequal access to health services across the wealthy and poor, and between the insured and uninsured, and created widening disparity in the health status of Chinese population.

Unequal Access: Table 1 presents a summary of the average number of inpatient and outpatient visits by province, ranked by per capita income from poor to rich. The usage figures indicate how public health service has been targeted. They show that the redistributive, or target, impact of public health services was highest for users in the poorest provinces. In 1980, the average number of inpatient and outpatient visits were highest among the two poorest quintiles of provinces, but these indicators are at odds with an apparent reduction in usage among poorer provinces in 1993. The elimination of the rural cooperative health scheme and the introduction of user fees prompted costs of access to health services to rise among the poor.

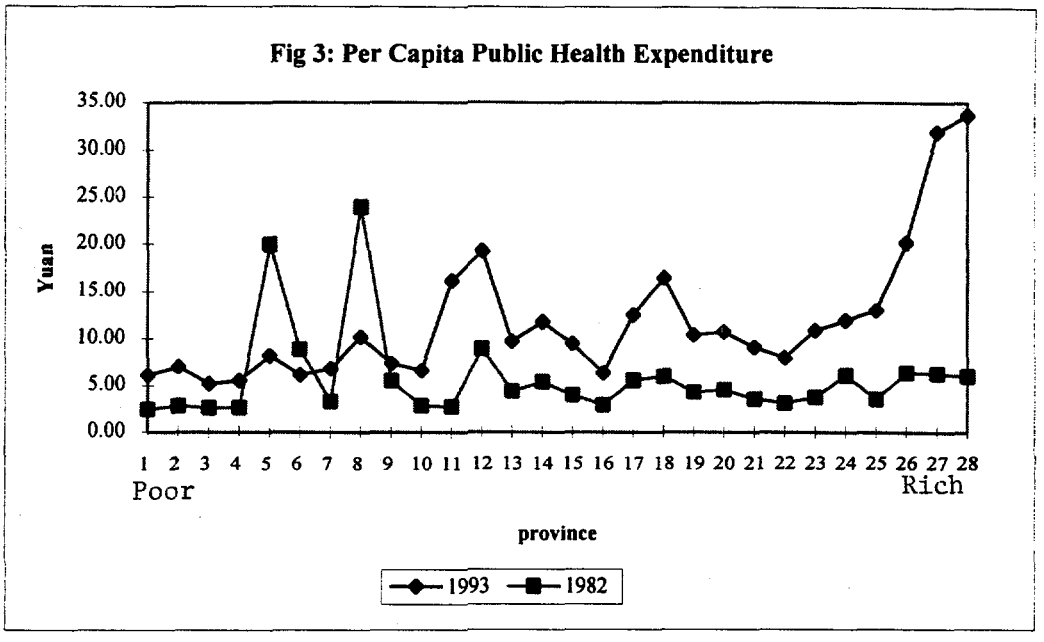


Fig 3: Per Capita Public Health Expenditure
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
Yuan
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
Poor
Rich
province
1993
1982

Figure 4

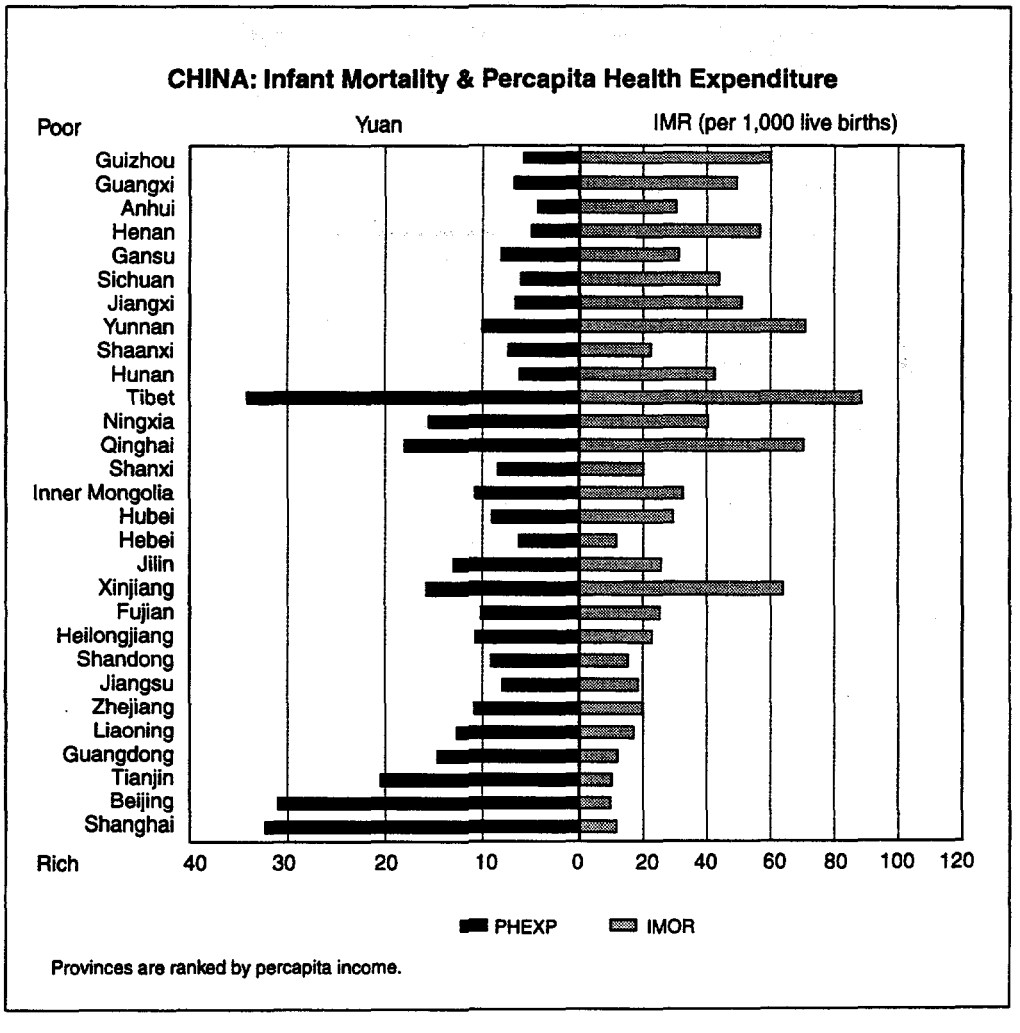
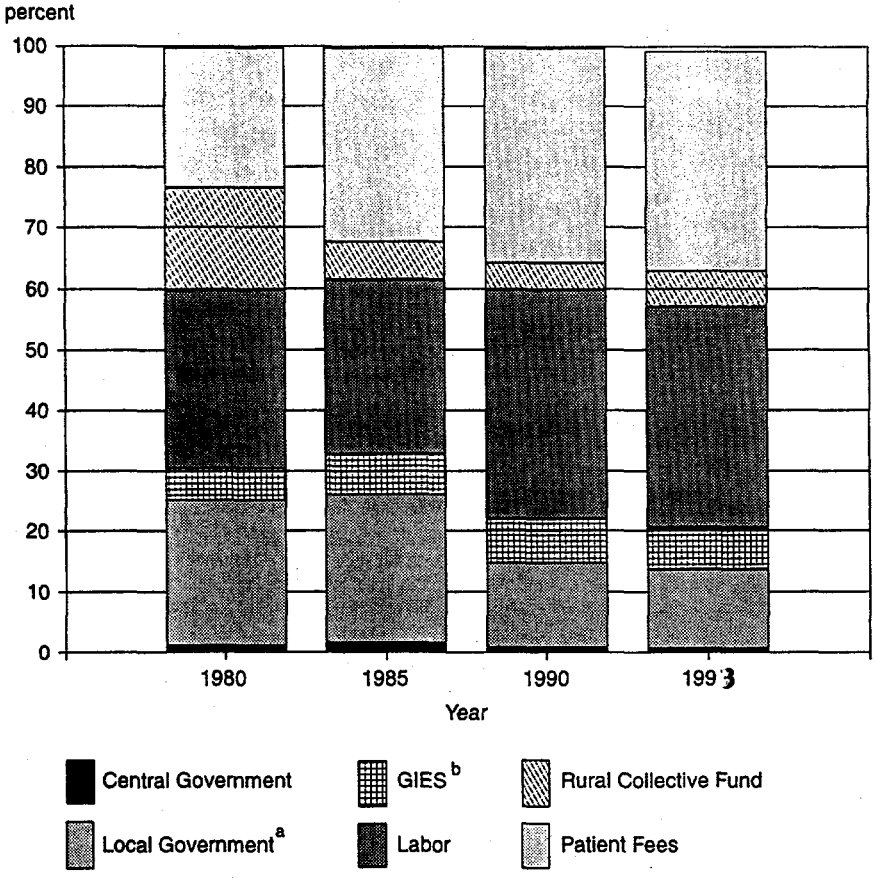

CHINA: Infant Mortality & Percapita Health Expenditure
Poor
Yuan
IMR (per 1,000 live births)
Guizhou
Guangxi
Anhui
Henan
Gansu
Sichuan
Jiangxi
Yunnan
Shaanxi
Hunan
Tibet
Ningxia
Qinghai
Shanxi
Inner Mongolia
Hubei
Hebei
Jilin
Xinjiang
Fujian
Heilongjiang
Shandong
Jiangsu
Zhejiang
Liaoning
Guangdong
Tianjin
Beijing
Shanghai
Rich
40 30 20 10 0 20 40 60 80 100 120
PHEXP
IMOR
Provinces are ranked by percapita income.

Figure 5

China
Source of Financing Health Expenditure
(Pecentage Share)



[a] *Local Government = aggregate expenditure of province + county + municipality*

[b] GEIS: Government Employees Insurance System

Source: **Table 7 (Annex).**

Table 1: Annual Average Number of Inpatient and Outpatient Visits in Provinces by Quintiles Per Capita Income

Quintiles of Per Capita Income in Provinces		*1980*		*1993*	
		Inpatient	*Outpatient*	*Inpatient*	*Outpatient*
Poorest	I	2.9	3.7	1.8	2.8
	II	2.6	3.5	1.7	2.7
	III	2.7	3.4	1.9	2.4
	IV	2.2	2.8	2.1	2.5
Richest	V	1.8	2.5	1.6	2.2

Source: Staff Estimates from MOPH data.

Indeed, according to the 1993 National Health Survey (NHS), utilization varies positively with household income per capita. Province-wide data indicate greater under-use of service in poorer provinces is associated with economic reasons, and vice versa. Of total households, 58.8 percent in rural areas and 39.8 percent in urban areas do not use public health facilities due to economic difficulties. Another factor is the deterioration in quality of public health services due to the reduced public spending since the mid-1980s. The emergence of private sector and liberalization of pharmaceutical sales permitted users, particularly the rich, to move away from public sector to seek costly and perhaps better quality private health care providers. This is partly substantiated by the 1993 NHS. Of total households 11 percent in urban areas and 13 percent in rural areas did not seek public health provider due to poor quality, and about 7 percent used private health clinics but mostly in big cities and urban areas. A third factor may be the declining age-specific morbidity rates, requiring fewer visits to health facilities. But, age and gender-specific mortality and morbidity rates have shifted from infectious to more NCD and injuries, and not declined dramatically to warrant such marked reduction in the utilization of health services. This overall decline in public inpatient and outpatient utilization in poorer provinces indicates that the redistributive impact of public health expenditures is increasingly becoming less favorable.

Disparity in the Health Status: Table 2 displays the percentage change in two health outcomes and coverage of three public health services by provinces, ranked by per capita income from poor to rich. Overall, for the period of 1983-93, disparity in health outcomes--both infant and maternal mortality rates-- has widened, as mortality declined at a faster rate in the wealthiest provinces like Zhejiang, Liaoning, Guangdong (quintile V) than in poorest provinces like Anhui, Henan and Sichuwan (quintile I). Likewise, except richest provinces in quintile V, public health services like coverage of safewater and sanitation generally varied directly with income, that is, the richer the province, the wider the coverage. Thus, except for three shots of diphtheria-pertusis-tetanus (DPT3) immunization, the progressivity in the access to two basic public health services has diminished over time.

Table 2: Percent Change in Health Indicators by Provinces, 1983-93
(Provinces ranked by per capita income)

Quintile of Provinces		Percent Change: Public Health Spending	Infant Mortality Rate	Maternal Mortality Rate	Coverage of: DPT3	Sanitation	Safewater
Poorest	I	93	-4.1	-4.3	68.8	58.6	89.1
	II	77	-21.8	-4.4	58.9	85.4	90.2
	III	69	-20.3	-10.7	50.2	77.4	59.9
	IV	65	-30.1	-17.3	67.1	77.3	73.1
Richest	V	58	-32.5	-18.3	57.3	38.2	35.4

Source: Staff Estimates from MOH data.

Costs and Quality:

The average private out-of-pocket costs per visit to public health services vary widely across quintiles. Private expenditures on health care are shown in Table 3, ranked according to quintiles, from poor to rich in urban areas. Although the wealthiest households pay larger absolute amounts on medical items, as a proportion to non-food household spending, the poorest households spend about 1.5 times more on medical care than do richer households. Of total non-food expenditure, drugs and medicine consume about 3 times more among the poorest quintile than among the top quintile. User fees-non-food expenditure ratio--a measure of affordability--is much larger for the poorest 20 percent (2%) than for the richest 20 percent (0.60%). The top quintiles spend more on other category which mainly comprises charges for physician's home visits.

One indirect indication of quality gap is the difference in private expenditures on medical care across quintiles of household income for the same level of services. According to the findings in Table 3 the top quintile pay more in absolute amounts and buy better quality, particularly instruments and drugs. Another indicator is the quality of medical attention received by the low-income population who use public health facilities. The 1993 NHS suggests that the poor are more likely to use Township medical centers when sick, but the probability of being treated by qualified doctor is less than 20 percent. Whereas, the rich are more likely to seek treatment in hospitals where the probability of consulting trained doctor is more than 60 percent. A third indicator is the paucity of qualified medical personnel in poorer provinces which exacerbates the quality of medical attention. The calculation of relative medical personnel ratio (RPR) in Table 4 shows a clear undersupply of qualified doctors in poorer provinces and an oversupply of such personnel in richer provinces.

Table3: Affordability :Per Capita Household Expenditures on Medical and Health Care, 1992 (As percentage of Non-food per capita expenditure)

	Quintiles of household per capita income					*Expenditure*	*T-ratio*
	I	*II*	*III*	*IV*	*V*	*Elasticity*	
Instrument	0.04	0.04	0.31	0.41	0.44	0.85	1.04
Primary health care	0.96	0.11	0.12	0.14	0.13	1.45	1.93
Drugs	5.65	4.23	4.08	3.68	2.91	8.11	4.56
Herbal medicine	0.47	0.42	0.44	0.45	0.50	6.63	2.87
Service charges	2.05	0.92	0.62	0.76	0.60	1.15	0.77
Other[a]	0.11	0.08	0.09	0.10	1.05	0.94	1.23
Total	9.28	5.81	5.66	5.54	5.63		

a. Home visits.

Source: SSB: Urban Income Expenditure Survey, 1992.

Table 4: Quality - Medical Personnel Input Mixes by Province (1994)

Province by quintile of per capita income	*Doctor*	*Special Nurse*	*Relative Personnel Ratio(RPR)* *Asst. Doctor*	*Nurse*	*Midwife*
I	0.81	0.77	0.82	0.67	0.74
II	0.94	0.95	1.07	0.90	0.61
III	1.34	1.23	1.34	1.26	1.05
IV	0.86	1.15	1.24	1.16	1.40
V	1.90	2.38	1.76	2.48	1.33

RPR= (Provincial Staff/Provincial Population)/(National Staff/National Population)
RPR exceeding one indicates oversupply and less than one indicates undersupply of medical personnel.

Source: Table 9 (Annex) .

Efficiency:

Greater Inefficiency: In addition to equity problems, China is getting less incremental health improvement as a return on its expenditures than in the mid-1980s, thus creating efficiency problems. Once again, Table 2 shows how the maximum outcomes--percentage reductions in infant and maternal mortality rates--have been achieved with minimum percentage increments in public health expenditure. It is clear that the greater the percentage increase in public health spending the smaller the reduction in mortality rates in the poorest provinces (quintile I) than in the wealthiest provinces (quintile V) between 1982 and 1993. Figure 6 shows that most of the wealthy provinces are significant (negative) outliers, having lower infant mortality rates predicted for its government health spending. When regression is done with provincial data, the impact of government health spending on reducing mortality rates in 1982 was greater in poorer provinces than in richer provinces. Conversely, in 1993, a somewhat reduced effect of government health spending on health status was found in poorer provinces than in wealthy provinces (Technical Annex A).

Relative Effects of Public Policies on Health Status. Before eliciting future strategies in the final section, it would be useful to assess the effects of several public health interventions on the overall health status of Chinese population. For more than three decades, China has made remarkable stride in improving the health status of its population. Given the extent of this progress, it is important to examine whether the improvement in health outcomes can be linked to specific components of public policy or, as is also possible, whether the achievement is due mainly to gains in overall income overtime. Thus, this section posits to what extent can particular government policies such as public expenditure on health, access to various public health services improve the health status of the population?

Regressions are used to assess the impacts of changing government policies and income levels on infant mortality rates and life expectancy at birth. The data used are a time-series of 1983-93 from cross-section of 29 provinces in China. To isolate the relative effects of each determinant of health improvement, three different econometric procedures are used, and Table 5 presents the results[1].The empirical results indicate the importance of income, public health expenditures, sanitation and DPT3. Income is consistently the most important variable in reducing mortality. The OLS estimates show that provinces with coverage of safewater and sanitation facilities have had low infant mortality rates. The positive coefficient on public health expenditures reflects that more money is being spent in those provinces where infant mortality rates are high. The impact of such expenditures is manifested in the fixed and random effect columns. Indeed, the results show that overtime, greater allocation of government resources did have a favorable impact in reducing infant deaths, suggesting that higher expenditure, generally synonymous with expanded supply of drugs, consumables, and equipment, can be effective in improving health status.

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[1] To disentangle the relative impacts of income growth and public policy variables (expenditures, sanitation, safewater, DPT3) on infant mortality rates and gains in life expectancy at birth, three methods are used, simple OLS without provincial dummies; a fixed effect model with provincial dummies, and random effect with generalized least squares (GLS).

Figure 6

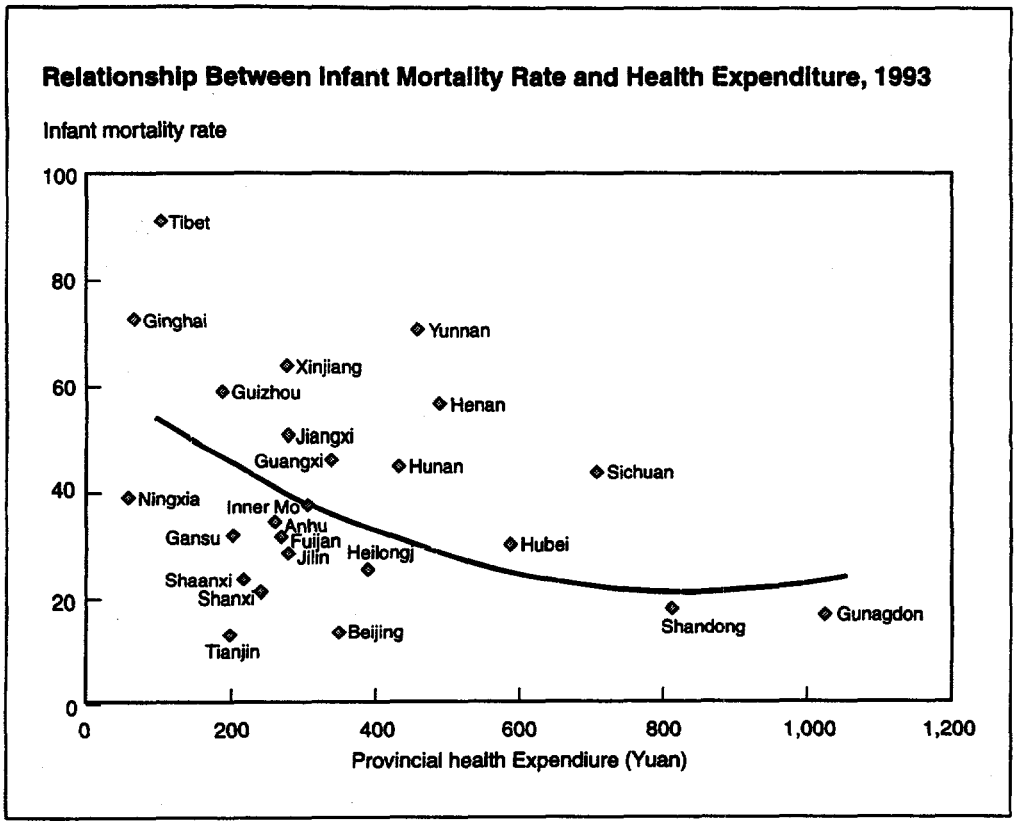

Relationship Between Infant Mortality Rate and Health Expenditure, 1993
Infant mortality rate
100
80
60
40
20
0
Tibet
Ginghai
Yunnan
Xinjiang
Guizhou
Henan
Jiangxi
Guangxi
Hunan
Sichuan
Ningxia
Inner Mo
Anhu
Gansu
Fuijan
Jilin
Heilongj
Hubei
Shaanxi
Shanxi
Beijing
Shandong
Gunagdon
Tianjin
0
200
400
600
800
1,000
1,200
Provincial health Expendiure (Yuan)

Table 5: Regression Results of Public Policies on Health Status

Dependent Variable: Infant Mortality Rate

Right hand side variables	*OLS Estimates*	*Fixed Effects*	*Random Effects*
log Income per capita	-0.688* (9.828)	0.049 (1.28)	-0.509* (-6.97)
log per capita Health Expenditure	0.249 (4.44)	-0.114* (-2.20)	-0.531* (-8.16)
Safe water	-0.234* (-4.178)	.052 (1.3)	NC
Sanitation	-.154 (-1.811)	-0.286* (-3.404)	-0.200 (-0.83)
DPT3	0.134 (1.13)	-0.259* (-2.192)	-0.242* (-3.15)
N	348	348	348
Adj. R^2	0.55	0.96	0.20

*Indicates significant at 5% confidence level. Numbers in parentheses are the t-statistics.

Immunization and sanitation clearly have discernible independent impact on improving health status in all empirical specifications. The DPT3 variable measures the percentage of one-year old children receiving a full series (3-shots) of diphtheria, pertussis and tetanus immunizations. Results also show that the efficacy of the logistical support of health system because the completion of three-shot sequence requires a fully organized personnel who interact routinely with the population. Likewise, sanitation needs community support and better coordination with health personnel. Interventions in sanitation and immunization, spearheaded by commune health system in China have attained remarkable successes to combat infectious diseases and reduce infant deaths.

But when an interactive term between income and government health expenditure is included in a separate regression, a somewhat interesting result emerges (Technical Annex A). In this case the coefficient on the expenditure variable by itself is the first derivative if income is zero that tends to counterbalance the direct effect of expenditure on infant mortality given a negative coefficient estimate on the interaction. It is difficult to disentangle autonomous government spending from implicit subsidy associated with the presence of more doctors and therefore induced by more demand and income. Other than income, such public health services as santiation and DPT3 still show strong effects on improved health status. At least this is consistent across all regression estimates, and further justifies improved access to these basic services among rural and poor people.

Finally, the impact of government policy on health status is assessed with regression analysis using the cross-sectional country level data. In each country, a panel of cross-section (provinces or regions) and different time-series data were utilized. The results in several studies indicate uniformly favorable impact of immunization and water supply on health status in the Philippines, Malaysia and Viet Nam, while sanitation and immunization are more effective in China. Poor country such as Viet Nam faced stricter economic constraints than others in the sample during the period under review, and so improved health status is a result of rising income growth than public health spending. The dissimilar effects of public health spending in Viet Nam also reflects greater importance of other health promoting interventions for reducing infant deaths in a period of deteriorating health infrastructure, high incidence of infectious and water-borne diseases and poor quality of services. (See Technical Annex A).

Emerging Problems

Health Transition:

China is now completing its demographic transition from high fertility and mortality rates to low ones. The demographic transition has profoundly influenced the age structure of population and the cause of mortality which has set the stage for epidemiological change. As the population continues to age, the relative frequency of various causes of death changes, causing more chronic diseases to occur among the older population and fewer infectious diseases among the younger population. Figure 7 illustrates that the proportion of older population will rise from 9.5 percent in 1995 to 16 percent in 2020, and the proportion of deaths among this age group will increase from 55 to 65 percent because mortality rates from infectious and childhood diseases are decreasing disproportionately during the same period. By way of illustration, China's close Asian comparators--South Korea, Malaysia, and Thailand--will generally experience similar shifts in the age structure of their population and age pattern of mortality.

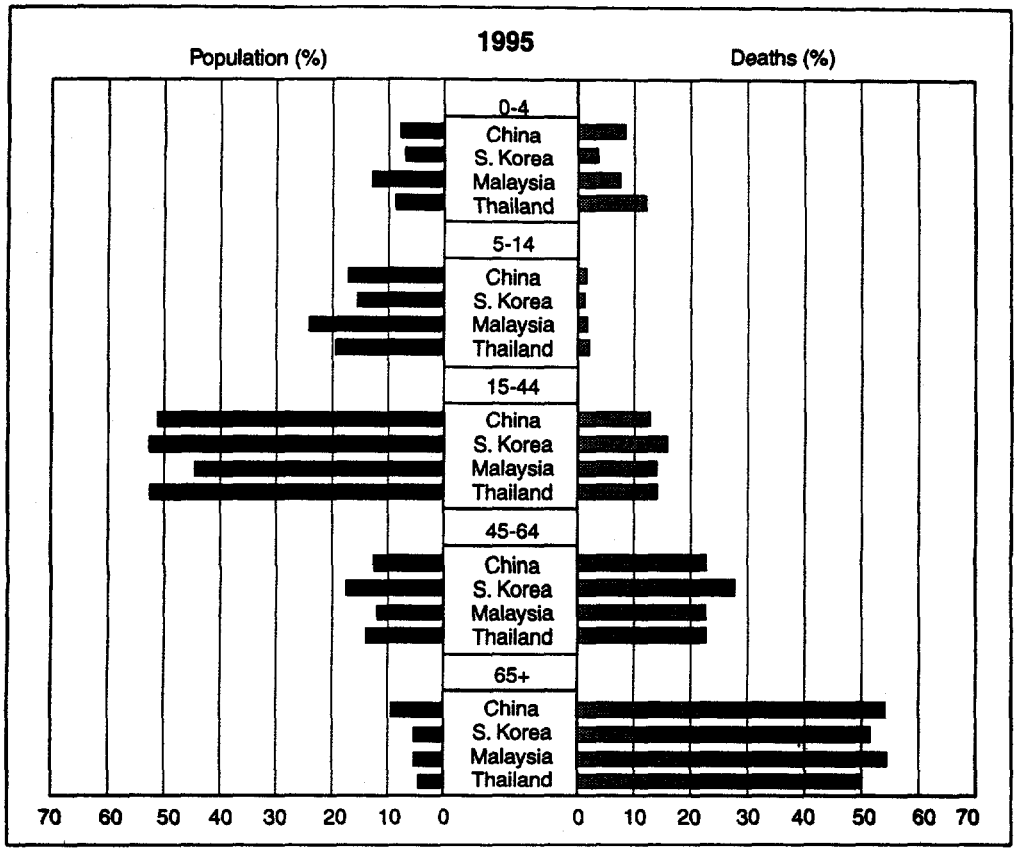
Changing Risk Factors

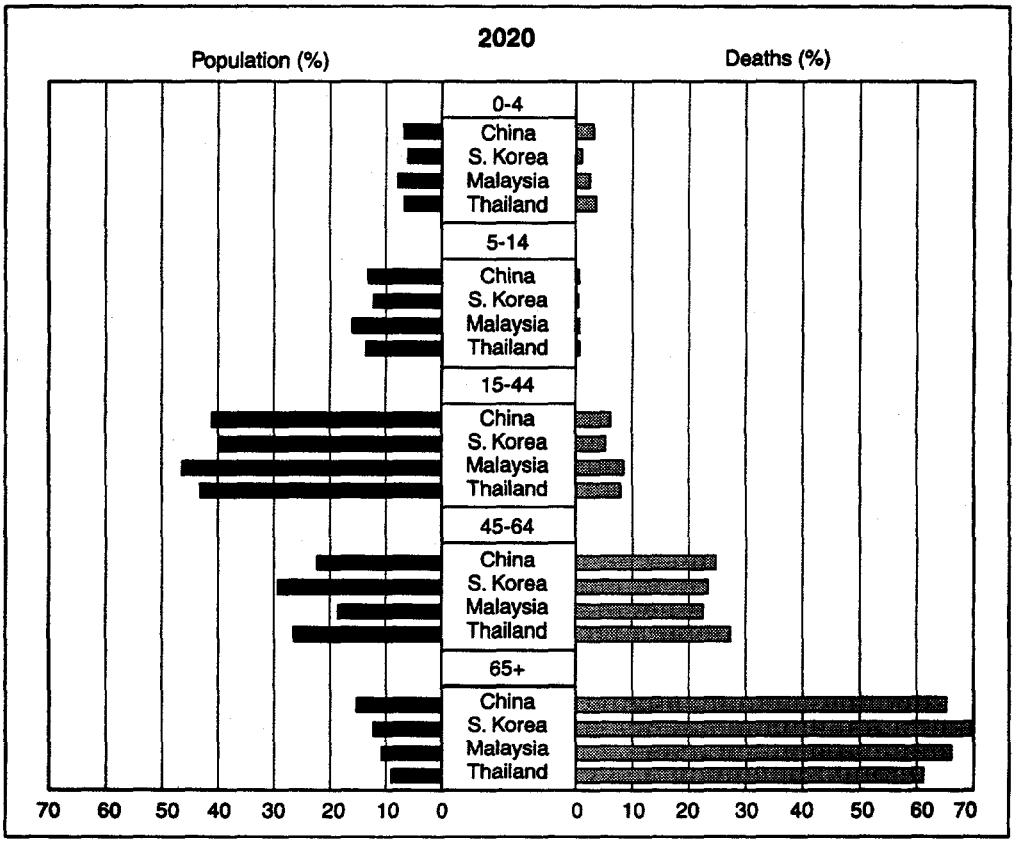
Lifestyle choices for example, cigarette consumption, alcohol intake, as well as such factors as urbanization, environmental pollution, and differences in access to health services are changing the exposure of China's population to the risks of different diseases. As a result, the pattern of disease is becoming more diverse across the provinces and socio-economic groups. Prior to the health transition, fewer diseases were responsible for the majority of deaths; now, with progress in the fight against immunizable diseases and diarrhea, the pattern of disease is increasingly being characterized by a "dilated-polarized epidemiological" regime in which infectious diseases and malnutrition coexist with non-communicable diseases and injuries both across rural and urban areas, and among poor and non-poor regions (Table 3, Annex).

Ironically, this growing diversity has come in the face of several successful public health interventions. New diseases have emerged and have resurfaced old ones.[2] Although the prevalence of sexually transmitted diseases (STD) and Acquired Immunodeficiency Syndrome (AIDS) is not yet

[2] For example, AIDS is a new disease, but this has brought back tuberculosis, and malaria has become widespread with the diminished vector control programs in several provinces in China.

Figure 7


1995
Population (%)
Deaths (%)
0-4
China
S. Korea
Malaysia
Thailand
5-14
China
S. Korea
Malaysia
Thailand
15-44
China
S. Korea
Malaysia
Thailand
45-64
China
S. Korea
Malaysia
Thailand
65+
China
S. Korea
Malaysia
Thailand
70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70


2020
Population (%)
Deaths (%)
0-4
China
S. Korea
Malaysia
Thailand
5-14
China
S. Korea
Malaysia
Thailand
15-44
China
S. Korea
Malaysia
Thailand
45-64
China
S. Korea
Malaysia
Thailand
65+
China
S. Korea
Malaysia
Thailand
70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70

significant, incidence rates are rising each year, with a real potential for explosive growth. For example, the incidence of STD has risen to more than 13 percent in 1994, the HIV- positive cases have now reached 1,600, including about 40 cases of AIDS, and malaria has reappeared with an incidence of 5.6 percent. The incidence of other communicable diseases like viral hepatitis and dysentery have is also high (Table 4, Annex).

Overall, when the total disease burden--the sum of all disability adjusted life years lost (DALY) by the population in China--is computed in Table 5 (Annex) , it is clear that the main contributors to the burden of diseases will dramatically shift from communicable to NCD and injuries in the 21st century. The NCD will account for the bulk of the disease burden--76 percent of total DALY lost in 2020--followed by injuries (17%) and noncommunicable diseases (6%). Of total DALY lost, malignant neoplasm and cardiovascular diseases will steal more than a half of healthy life years in China. Similar dramatic increase in DALY lost will occur from chronic obstructive pulmonary (COPD) from only 4 percent in 1993 to nearly 16 percent in 2020 due to smoking the single most important factor and other new health risks including air pollution.

III. Strategic Directions For 21st Century

The analysis shows that composite changes in demographic, epidemiological, and risk factors imply a growing health burden from NCD and injuries and a higher adult mortality risks which in turn will change the volume and composition of the demand for referral and curative health services. Since the prevention of these diseases has not been a part of primary health program until recently, they will pose new challenges in the design and management of public health services in the future. In addition, by emphasizing revenue-generating curative services rather than basic preventive health care, economic reforms have created inequities and inefficiencies in the health system, along with rising medical costs. As China enters the 21st century, the following strategies will be required to respond to the new health challenges and the emerging threat of diseases.

Resolving current problems:

Strengthening Public Health Programs. China's public health program (PHP), once the envy of many developing countries, has now begun to exhibit inequities and inefficiencies. The main challenge is how to give the uninsured and the poor better access to affordable PHP without affecting the quality of services. Based on the assessment of the burden of main diseases and cost-effective public health and essential clinical interventions. Box 1 proposes a basic health service package that consists of *essential* PHP, and *minimum* clinical services. These two packages are designed to meet externalities to which those at risk and in poverty are most exposed. Together, essential PHP and minimum clinical package would reduce the share of illness in terms of disease burden averted from 28 percent in 1993 to roughly 39 percent in 2020. These two packages can be delivered at a per capita cost about US$ 10 which would increase approximately to US$ 60 in 2020, given changes in epidemiology, age structure of the population and the costs in medical supplies. As an useful guide for China, per capita costs of combined packages in such middle-income

countries as South Korea, Turkey, Costa Rica, South Africa vary from US$20 to a maximum of US$ 350.[3]

BOX 1

	(1) Essential Public Health Package	(2) Minimum Clinical Package	(3) Discretionary Clinical Package
1993			
Burden of Disease Averted (%)	14.8	14.0	
Per capita cost (US$) (Annual)	3.7	6.3	30-45
2020			
BOD Averted (%)	18.2	25.1	
Per capita cost (US$) (Annual)	8.8	20.2	

Note: Major interventions under each package are outlined in Technical Annex A

Epidemiological and demographic data are used to calculate the benefits as disability adjusted life years saved (DALY) from interventions under essential PHP and minimum clinical package. The estimates show that interventions under (1) and (2) above packages would reduce the burden of diseases including most of the "remaining" and "emerging" diseases (Table 3 Annex 2) by about 28 percent in terms of total DALY saved observed in 1993. The itemized costs of specific interventions were provided by the MOH and Chinese Academy of Preventive Medicine (CAPM) and estimated from project preparation activities. By applying similar procedure, a rough projection shows that essential PHP and minimum clinical interventions would reduce BOD by 43 percent in 2020, an overall gain by 15 percent. If legislative measures, outside the purview of the PHP, are implemented , further reduction in the BOD from injuries and COPD would be possible.

For methodologies, see C.J.L Murray and A.D Lopez in their report, "Global Burden of Disease" Bulletin of the World Health Organization, 1990, 72 (3).

The government should increase its spending level to meet these service requirements not only because such interventions are the most cost-effective but also because of a salutary impact of government expenditure on improving health status of Chinese population, as revealed by our regression estimates with panel data. Moreover, resource requirements are modest compared with

[3] These figures capture roughly 2 to 7 percent of those countries GNP. See World Development Report 1993, World Bank, Oxford.

overall health spending. Additional resources for targeting the uninsured poor can come from an extension in the coverage of social insurance (GIS and LIS), the passage of a basic package in social as well as future private insurance policies, and selective increases in user fees for the uninsured wealthy. The discretionary clinical package can be financed from user fees and insurance and public funds should be used only for truly poor and indigent patients.

Redeploying Medical Personnel. Alternative mixes of labor inputs are influenced by the allocation of public spending which in turn will influence future health outcomes. In China, indices of labor input for western medical treatments show an inegalitarian allocation across provinces. Poor provinces are deprived of more qualified medical staff. Table 4 showed the distribution of more qualified health personnel (doctors, assistant doctors) and less qualified health personnel (specialized nurses, nurses, and midwives). Computed on the basis of relative personnel ratios (RPR) the richest quintile of provinces-- Beijing, Shanghai, Guangdong, Zhejiang, Tianjin and Liaoning clearly have an oversupply of all medical staff but particularly of more qualified staff, as the value of RPR far exceeds unity. Conversely, the poorest quintile of provinces--Guizhou, Xinjiang, Anhui, Henan, Guangxi and Sichuan (Annex Table 9)--have an undersupply of all medical staff including more qualified personnel. Other less disadvantaged provinces in the second quintile--Jiangxi, Yunan, Shannxi, Hunan, and Tibet--also have an undersupply of more qualified medical personnel especially doctors.

Besides their impacts on health outcomes, the different mixes of health personnel will have important underpinnings on cost efficiency. In provinces with high morbidity and mortality rates from infectious and communicable diseases, redeploying the personnel mix toward more preventive health services staff like nurses and midwives can generate further cost savings. To attract and retain more qualified staff in poorer provinces, the government should also provide such incentives as housing, bonuses, education for dependents, and better posting after service in rural areas. To minimize future imbalance in labor input mixes, another powerful policy instrument is to upgrade training and retraining for less qualified health personnel and then substitute them for more qualified staff where feasible. To implement these policies, the government should ease its currently rigid controls on remuneration to make it more amenable to local needs. However, whether the local or the central government should be given authority to choose the structure of such benefit package remains an open question.

***Targeting of resources*:** One implication of reduced government health financing is that the poor has suffered higher morbidity and mortality. Among the poorest quarter of the rural population, infant deaths are 3.5 times greater than among city dwellers (NHS 1991). Compounding this inequity is the wide disparity in the distribution of provincial government health expenditures particularly in the past few years. Further econometric analysis with 1993 data indicates that province-level public spending on health responds more strongly to changes in GDP in high-income provinces than in low-income provinces. Moreover, a one percent growth in provincial income is associated with much greater increase in government health expenditure in richer provinces than in poorer ones. These results are disturbing, since they imply that even with equitable growth in income across provinces--an unlikely prospect--the *distribution* of provincial government expenditure on health will become *more unequal*. If economic growth in the province alone is less likely to reduce the imbalance in provincial health expenditures, a strong case can be

made for the central government to target an increasing share of central government resources to the poorest provinces.[4]

While a larger proportionate increase in government spending on health in the poorer provinces than in the richer provinces will clearly promote *equity*, its relative effect on *efficiency* is not immediately obvious. Indeed, the latter depends much on the *marginal* impact of increased public health expenditure on health outcomes. Table 5 reports the impact of a 1,000 yuan increase on infant mortality rates by quintile of provinces. An increase of 1,000 yuan in per capita provincial government health spending in high-income provinces is associated with drops in infant mortality of only 0.12 percent. Conversely, similar increase in per capita health expenditure leads to a decline of infant mortality by 3.04 percent in poorer provinces. Thus, a 1,000 yuan increase in health spending yields much faster decline in infant and maternal mortality in poorest provinces. Because poorest provinces account for more than 30 percent of the total population of China, a strategy of redistribution of central government health expenditure from richer to poorer provinces will generate a larger overall decline in infant mortality, and as such will improve the overall efficiency of public health financing.

Table 5: Impact of a 1,000 yuan increase in provincial government health expenditure on infant mortality, 1993

Quintile of Provinces	*Percentage of population*	*Infant mortality*	*Maternal mortality*
I	30.8	-3.04	-1.01
II	15.6	-2.45	-0.67
III	17.2	-1.05	-0.44
IV	24.2	-0.43	-0.23
V	13.9	-0.12	-0.03

Source: Staff estimate from MOPH data.

Restructuring User Fees. The combination of recent worsening income distribution, reduced government health spending and price decontrols (resulting in higher prices for health care and other consumable) reduced utilization of health services, consequently worsening their health status particularly in poor provinces. The government is concerned about cushioning the poorest of the poor from further higher health costs stemming from changing age pattern of diseases and greater cost recovery in public health sector. Indeed, better targeting of public expenditure to improve access of the poorest to health facilities would depend on two policy instruments: reducing user costs associated with treatment and drugs, and improving the quality of care for those who actually gain access.

[4] The implied GDP elasticity of provincial government health expenditures varies from a low of -0.098 for Guizhou, the poorest province in China, to a high of 2.56 for Shanghai, the richest province.

A more effective mechanism should be devised to protect the poor from user fee increases; the current mechanism in place in China to exempt the indigent from fees is not working. As household expenditure data showed there is a weak relationship between household income and the average price paid for treatment, that is, households in the bottom income quintile spend a disproportionately high share (13 percent) of their total health expenditure on one annual visit. They also spend more on drugs, which are generally not subsidized. Of total private health spending, the poorest households pay 77 percent on drugs compared with 68 percent by the richest quintile. Thus, the burden of paying for service charge and drugs is higher among the poor than the better off. Since this disproportionate burden prevents the poor from using public health facilities, then improving access for them may require selective price reductions for essential services; the poorest hard-to-reach group should be exempt from paying fees, which may be compensated for by increases in public spending and other insurance fees. This needs an appropriate pricing policy that differentiates prices by the income of users

Finally, improving the quality of public health services would enhance utilization. One indicator of the quality gap is the variation across income groups in the amount of household expenditure on public health, but another indicator, available from the 1993 NHS, is that 15 percent of households do not use public health facilities due to the lack of beds (4.1%) and the absence of proper services and treatment (11.3%). Interprovincial variation is even wider. Another indicator is that the poor are less likely than the better-off to receive treatment by qualified and trained doctors when they are sick. Spending on medical equipment, supplies, drugs, and physical infrastructure in township health centers and the redeployment of trained personnel in needy areas would considerably improve the quality of services available to the poor.

Addressing Emerging Problems:

Strengthening the Information, Education and Communication (IEC): The disease burden in China implies that about two-thirds of premature deaths and disabilities stem from such risk factors as excessive smoking, improper diet, alcohol intake, the lack of exercises, environmental abuse, or dangerous sexual practices. These factors are linked to the behavioral choices of individuals and have a combined synergistic effect. Discouraging these unhealthy choices by individuals is difficult, given the complexity of emotional, intellectual, and social influences that shape the decisions of population. One viable strategy would be to have the government join with the private sector to strengthen the IEC network and its efforts to deliver one overriding message--that eliminating or reducing exposure to risk factors via immunization, maternal weaning, waste disposal, screening of treatable diseases, and changes in life styles is more effective and less expensive than the longer-term secondary treatment. The message should be delivered by the mass media, communication technologies, post-primary school curriculum, and reinforced by teachers and community workers.

Passing Legislation: The findings on the burden of diseases clearly suggest that the government should enact various legislative measures and restrictions to alleviate sufferings from NCD and injuries in the future. For example, to reduce the risks of obstructive pulmonary disease which will account for more 14 percent of total DALY lost from NCD by 2020, the government should place legislative ban on cigarette smoking in public places, and among the younger population, as well as on the advertisement and promotion of any tobacco goods and trademarks. Together, these measures would gradually reduce morbidity and mortality from smoking-related diseases. It should also consider increasing taxes on tobacco as a disincentive to smoking, to

provide additional revenues to be devoted to public health programs. A rough calculation of such potential is obtained from revenue buoyancy estimates. The point estimates of revenues from non-tax, tax, and tobacco tax with respect to local government GDP exceed unity; and a 10 percent tobacco taxes tend to reduce cigarette consumption by 6 percent; reflecting that this levy is very buoyant revenue instrument and consumption deterrent. Other legislation and/or restrictions should targeted to reducing the risks of disability or death from injury, which will steal 16 percent of total DALY lost in 2020, up from the 10 percent figure in 1993. Transport accidents in particular should be targeted, since they account for more than a half of total DALY lost due to injury. Government transportation policy should seek to improve traffic safety by upgrading road design, traffic signals, and speed limits, and to modify drivers' behavior particularly with the imposition of higher fines for drunk drivers. Although studies on alcohol-related motor vehicle accidents and deaths in China are unavailable the U.S studies should alert the decision- makers of China.[5]

Reforming Urban Health Insurance. The urban health insurance schemes i.e GIS and LIS are providing inadequate coverage and face rising costs. Because, schemes cover only the employment-based population, capturing only 14 percent of the total population of China. Their costs are escalating in real terms due to growing number of claims, and they promise to rise in the future, as the population ages and the number of claims for curative care increases (Annex Table 7). "Moral hazard" factors also escalate costs, since they create incentives for health providers to offer more care than patients actually need and to overprescribe medication and tests. These profit earning opportunities may lead to an overconsumption of newly developed and expensive technologies as a substitute for less expensive diagnostic tests and surgical procedures. To enhance coverage and contain costs, the government should pursue four options: centralize the management of health insurance, extend GIS and LIS coverage, and redesign benefit packages including prepayment system.

Centralized management would create larger risk pools and provide administrative economies of scale, and capture employees who risk losing coverage as their SOEs face bankruptcy or merger under the SOE reform. A combined pool would also give local governments greater bargaining power for negotiating contracts on capitation payments. But implementation will require vigorous inter-agency coordination because comparatively young LIS beneficiaries would naturally oppose pooling their risks with their comparatively old GIS counterparts. In this respect, it is worth highlighting the experience of Jiujiang and Zhenjiang cities, which have combined the GIS and LIS systems in order to smooth the cost of health services over time by distributing it equally across the beneficiaries.

Coverage under the GIS and LIS could be broadened, first by including the dependents of beneficiaries and then by covering all labor in the formal and informal sectors. But the experience of Shenzhen health insurance scheme suggests that private and joint venture companies will not readily participate in this social health insurance scheme. Here, an alternative policy option would be to make hospitals liable for all overspending on the capitation payments (introduced in 1991), forcing them to invest and create trust funds with profits and unused capitation money. This option would gradually eliminate the 50 percent government contribution to such over-spending. The free-up resources would give additional leverage for financing the essential package for the uninsured.

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[5] In the U.S, more than 50 percent of all motor vehicle related deaths are alcohol-related. See for example, Anon 1990" Alcohol-related Traffic Fatalities: United States 1982-89" *Morbidity and Mortality Weekly* Report 39.

To contain sosts further, the government should consider redesigning the clinical services package covered by GIS and LIS, as well as implementing a prepayment scheme for health care providers. The redesigned package could consist of several parts, based on the degree of cost-effectiveness (Technical Annex A). Part A would include vaccinations, pre and post-natal care that can be reimbursed at full cost, Part B would be reimbursed at 80 percent of cost, and Part C would contain interventions that would be kept at the current level of underfinancing, with premium rates raised with inflation. This more flexible system can be adopted to and the level of copayment can be reconfigured according to the social insurance's fund position. Normally, providers will respond more to parts A and B than to part C, thereby improving the allocative efficiency of financing. Providers can collect fees from patients to cover the gap between GIS and LIS reimbursement and the full costs of the parts B and C interventions. Elsewhere among middle-income countries, such flexibility is being proposed in Brazil and Mexico.[6]

Strengthening the Rural Health Insurance: China's rural risk-coverage programs have weakened significantly due to the dismantling of the RCM insurance in the early 1980s. The rural population now relies on government subsidy and their own resources. To remedy this problem one alternative would be to reintroduce the rural community health insurance scheme with financing from household income, village social welfare funds and local government budget. Indeed, the Sichuan Rural Health Insurance Experiment should be replicated with special emphasis on a *local package* in the proposed essential PHP and minimum clinical interventions (Technical Annex A) but can be reconfigured differently to a diversified disease pattern and diverse population. Many villages have started to reestablish such insurance programs and they currently cover more than 10 percent of total rural population. Greater efficiency can be built into the scheme by allowing households to purchase an annual health card that would entitle the purchaser to a fixed number of treatments for curative care and an unlimited number of visits for such preventive services as maternal and child health care and immunizations. The card would be priced at less than the annual average household expenditure.

Developing Private Insurance: As the economy continues to grow, people may need supplementary insurance or individuals not covered by social insurance would like to purchase private insurance policies. The government should encourage the development of private insurance thus promoting greater diversity and competition in the supply of health services. In several middle-income Latin American countries the absence of competition in the provision of health care inhibited corruption and inefficiencies in their social security schemes, and even in countries like Korea and Japan, several semi-independent insurance firms compete over a single large insurance corporation. In China, however, specific legislation should be enacted to guard against abuse and forbid exclusion of pre-existing medical conditions. Until the new legislation in 1996, the U.S suffered from such problems, creating gaps in coverage and cost escalations. Since social insurance is already in place implementing safeguards over future private insurance should not be too difficult for China.

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[6] See World Bank,"Brazil: Health Sector Reform Project" (15522-BR)and for Mexico see, FUNSALUD: "El paquete universal de servicios de salud" Documento 11, para el analisis y la convergencia, 1994

ANNEX

Table 1: Change in Health Indicators in Selected Asian Countries: (percentage)

	Change (1965-94)			Change (1981-94)	
	Infant Mortality Rate	Under-5 Mortality Rate	Life Expectancy at Birth	DPT3	BATP a/
Bangladesh	-43	-24	39	700	
Bhutan	-26	-23	30		
China	-60	-40	24	12	30
India	-53	-50	36	80	35
Indonesia	-58	-52	36	77	37
S. Korea	-80	-70	42	21	67
Lao PDR	-37	-25	24	35	60
Malaysia	-78	-64	32	8	90
Mongolia	-54	-27	33	14	16
Myanmar	-36	-54	29		92
Nepal	-44	-31	18	155	12
Philippines	-44	-40	20	45	16
Papua New Guinea	-57	-67	36	-15	34
Sri Lanka	-74	-84	14	33	38
Thailand	-63	-74	28	50	39
Viet Nam	-62	-58	24	29	45
Mean	-54	-49	30		
Population weighted Mean	-50	-51	33		

a/ BATP= Births Attended by Trained Persons

Source: Calculated from World Bank data base

TABLE 2: BASIC INDICATORS OF OVERALL HEALTH DEVELOPMENT, 1993

	Public Health Expenditure as a percent of:		Mortality Rate (per 1,000)		Life Expectancy at Birth	% Change in Infant Mortality Rate
	of GNP	public expenditure	Infant	Maternal	(Years)	(1965-93)
Bangladesh	0.8	4.5	92	3.5	55	-43
Bhutan	1.7	2.6	127	NA	48	-26
China	0.5	2.7	34	0.1	69	-60
India	2.0	6.7	80	2.5	61	-53
Indonesia	1.0	3.8	66	3.3	61	-58
Korea	0.8	2.2	13	0.1	71	-80
Lao PDR	2.8	4.9	125	6.6	50	-37
Malaysia	2.9	6.8	15	0.3	71	-78
Mongolia	3.5	7.9	50	2.6	62	-54
Myanmar	2.1	6.8	72	0.7	60	-36
Nepal	1.2	4.3	101	5.8	53	-44
Philippines	1.2	4.9	51	0.9	64	-44
Papua New Guinea	3.6	10.1	61	6.0	54	-57
Sri Lanka	1.7	4.5	20	0.3	72	-74
Thailand	1.6	6.1	26	1.0	69	-63
Viet Nam	0.8	3.3	45	1.2	65	-62
Mean	1.6	5.0	62	2.3	62	-54
Population Weighted Mean			56	1.4	65	-50

Source: World Bank data file

Table 3: Health Problems Affecting Chinese Population

Age group	Population (%) 1995	2020	Deaths (%) 1995	2020	Existing Problems	Emerging Problems
0-4	8.8	6.9	8.6	3.1	ARI Diarrhea Malaria Measles Tetanus Polio P&E malnutrition	Injury Learning Disability
5-14	17.3	13.4	1.5	0.6	Geohelminth Micronutrient Schistosomiasis	Learning Disability
15-44	51.3	41.1	12.4	6.2	Malaria Maternal Mortality Tuberculosis	AIDS Injury STD
45-64	12.7	22.8	22.7	24.8	Malaria Tuberculosis	AIDS Injury STD Cancer Cardiovascular disease COPD Diabetes
65+	9.5	15.6	54.6	65.1	ARI Tuberculosis Hepatitis	Cancer Cataracts Disability Cardiovascular disease Depression Injury

Source: World Bank Population Projection , Staff Estimate from DS Survey, Beijing

Table 4: China: Ten Major Causes of Death, 1957-94

A. Diseases	Rank	1957 Deaths (%) Urban	1994 Incidence per 100,000	Rank	Urban	Rank	Rural
Respiratory disease	1	16.8		3	16	1	25.2
Infectious	2	7.9		9	1.3	8	1.4
Pulmonary TB	3	7.5	24.8	8	1.5	9	1.7
Digestive	4	7.3		6	4.6	6	1.8
Heart	5	6.6	23	4	14.9	5	4.8
Cerebrovascular	6	5.4	33.8	1	22.1	3	16.3
Cancer	7	5.1	32.2	2	21.8	2	16.5
Nervous system	8	4.1	13.6	7	1.6	7	1.8
Trauma	9	2.6		5	6.7	4	11.9
Other TB	10	1.9					

B. Incidence of Communicable Diseases

Viral Hepatitis	76.8
Dysentry	76.8
AIDS	0.02
STD	13.2
Measles	7.5
Pertusis	0.68
Diptheria	0.01
Hemorrhagic Fever	5.7
Malaria	5.6

Note: Rural deaths (%) and Incidence Rates are not available for 1957

Source: MOH and CAPM

Table 5: Burden of Diseases in China: Disability Adjusted Life Years Lost (DALY)

Disease	As a Percentage of Total DALY	
	1993	2020
Communicable Diseases	**21.6**	**6.2**
Hepatitis	10.7	3.6
HIV	0.1	0.2
Polio	0.1	0.5
Measles	1.1	0.8
Tetanus	0.5	0.2
Tuberculosis	8.3	0.9
Pertusis	0.8	0
Diptheria	0.1	0
Non-Communicable Diseases	**68.1**	**76.4**
Malignant Neoplasm		
Stomach Cancer	9.3	4
Liver Cancer	14.5	12.2
Lung Cancer	5.9	7.8
Breast Cancer	1.6	2.5
Cervix Uteri Cancer	0.3	0.2
Leukaemia	15.1	14.5
Cardiovascular		
Rheum Heart Disease	0.8	2.6
Ischemic	3.3	6.5
Cerebrovascular	13.4	10.3
COPD	3.9	15.8
Injuries	**10.4**	**17.4**
Transport Accident	4.8	5.3
Poisoning	0.3	0.8
Falls	0.4	1.6
Drowning	1.9	1.8
Drugs	2.3	7.3
Others	0.6	0.6
TOTAL DALY	**100**	**100**

Source: Staff calculation from CAPM surveys

ANNEX

Table 6: CHINA: Total Health Expenditure
(million Yuan)

	Current Prices			*1987 Prices*			*Percentage Share*		*As*
Year	*Public*	*Private*	*National Total*	*Public*	*Private*	*National Total*	*Public*	*Private*	*Public*
1983	10686	7153	17839	8271	5536	13807	59.9	40.1	1.8
1984	12248	8591	20839	9970	6993	16963	58.8	41.2	1.8
1985	14309	8867	23176	12921	8007	20928	61.7	38.3	1.7
1986	18116	9612	27728	17138	9093	26231	65.3	34.7	1.9
1987	20844	12789	33633	20844	12789	33633	62.0	38.0	1.8
1988	26556	16716	43272	23711	14925	38636	61.4	38.6	1.9
1989	30886	20422	51308	25111	16603	41714	60.2	39.8	1.9
1990	35814	23798	59612	27132	18029	45161	60.1	39.9	2.0
1991	41047	30435	71482	29173	21631	50805	57.4	42.6	2.0
1992	48690	35850	84540	33077	24355	57432	57.6	42.4	2.0
1993	52076	37801	89877	36673	26620	63294	57.9	42.1	1.9
Average	28297	19276	47573	22184	14962	37146	60.2	39.8	1.9

Note: Public Sector includes central & local governments, and SOE expenditures.
Source: MOPH.

ANNEX

Table 7: Sources of Financing Total Health Expenditure (Current Prices, Million Yuan)

	Domestic sources							
	Government budget		*Insurance*		*Rural Collective*	*Patient*	*Foreign*	
Year	*Central*	*Local*[a]	*GEIS*[b]	*Labor*	*Fund*	*fees*	*aid*	*Total*
1980	152	3033	668	3725	2110	2944	NA	12632
1981	172	3244	786	3964	2030	3608	NA	13804
1982	214	3761	908	4677	2100	3648	NA	15308
1983	233	4258	1090	5105	1040	6113	NA	17839
1984	286	4898	1269	5795	1230	7361	NA	20839
1985	400	5686	1544	6678	1430	7437	NA	23176
1986	509	6631	1888	9088	1640	7972	NA	27728
1987	534	6551	2221	11538	1940	10819	NA	33633
1988	572	7143	2912	15929	2550	14166	NA	43272
1989	574	7872	3811	18629	2427	17995	NA	51308
1990	563	8286	4434	22531	2609	21189	NA	59612
1991	552	8907	5041	26547	3450	26985	NA	71482
1992	585	10748	5811	31546	4658	31192	NA	84540
1993	623	12403					NA	

NA: Not Applicable under the Budget Reporting System

a. Local government = aggregate expenditure of province + county + municipality
b. GEIS: Government Employees Insurance System.

Source: MOPH.

ANNEX

Table 8: Uses of Government Health Expenditure (percentage)

	Million Yuan			*Share*		
Year	*Preventive*	*Curative*	*Total*	*Preventive*	*Curative*	*Total*
1980	556	1785	2341	23.8	76.2	100
1981	580	1939	2519	23.0	77.0	100
1982	639	2285	2924	21.9	78.1	100
1983	705	2497	3202	22.0	78.0	100
1984	850	2771	3621	23.5	76.5	100
1985	960	3038	3998	24.0	76.0	100
1986	1114	3620	4734	23.5	76.5	100
1987	1142	3586	4728	24.2	75.8	100
1988	1314	3890	5204	25.2	74.8	100
1989	1473	4349	5822	25.3	74.7	100
1990	1620	4759	6379	25.4	74.6	100
1991	1760	5057	6817	25.8	74.2	100
1992	2346	5743	8089	29.0	71.0	100
1993	2857	6356	9213	31.0	69.0	100

Source: MOPH.

ANNEX

Table 9: Relative Personnel Ratio by Province (RPR)[a]

Province	Special		Assistant		
	Doctor	Nurse	Doctor	Nurse	Midwife
Guizhou	0.57	0.58	1.16	0.65	0.77
Guangxi	0.67	0.99	0.74	0.75	0.62
Anhui	0.60	0.74	0.78	0.57	1.03
Henan	0.80	0.70	0.68	0.64	0.75
Gansu	1.02	0.84	0.85	0.85	0.43
Sichuan	1.23	0.79	0.77	0.59	0.90
Jiangxi	0.96	0.98	0.73	0.87	0.80
Yunnan	0.75	0.87	1.09	0.78	0.62
Shaanxi	1.38	1.00	1.00	0.92	0.71
Hunan	0.96	0.81	0.73	0.83	0.73
Tibet	1.08	0.82	1.49	0.66	0.23
Ningxia	1.12	1.26	1.41	1.37	0.62
Qinghai	1.48	1.64	1.25	1.09	0.95
Shanxi	1.65	1.07	1.29	1.30	1.12
Inner Mongolia	1.45	1.06	1.91	1.34	1.08
Hubei	1.34	1.34	0.96	1.25	1.56
Hebei	0.95	0.66	0.96	0.81	0.60
Jilin	1.21	1.65	1.67	1.78	1.02
Xinjiang	0.72	1.85	1.93	1.74	1.03
Fujian	0.94	0.67	1.00	1.02	1.92
Heilongjiang	1.21	1.62	1.55	1.56	1.06
Shandong	0.72	0.93	0.68	0.89	1.20
Jiangsu	0.80	1.03	1.15	0.92	1.38
Zhejiang	0.83	0.77	1.16	0.87	1.76
Liaoning	1.22	2.00	1.46	2.16	1.00
Guangdong	0.89	0.73	0.97	1.22	1.02
Tianjin	2.71	2.69	1.09	2.31	1.11
Beijing	2.67	3.73	2.24	3.78	1.02
Shanghai	2.01	2.74	3.03	2.91	2.53

a. RPR= (Provincial Staff/Provincial Population)/(National Staff/National Population)

RPR exceeding one indicates oversupply and less than one indicates undersupply of medical personnel.

Source: Staff calculations from MOH data

TECHNICAL ANNEX A

This section uses epidemiological, demographic and socio-economic data to calculate the benefits as disability adjusted life years saved (DALY) from several interventions from public health care (PHC) and clinical services (CS) It then examines cost-effectiveness of each major intervention under PHC and CS. Using such epidemiological data as the average age at onset of disease or disability, case fatality rates, duration of disability, and the incidence of disease from Disease Surveillance conducted by the Chinese Academy of Preventive Medicine (CAPM) Beijing, the total disease burden--the sum of all DALY lost by the population in China in 1993--is computed first (Table 5, Annex 2). It is clear that non-communicable diseases (NCD) account for the bulk of the disease burden--68 percent of total DALY lost--followed by communicable diseases (22%) and injuries (10%). Having estimated the *loss* in DALY, the next step was to compute the *gains* in DALY that would be possible under each major intervention in PHC and CS. The data on costs of specific interventions were obtained through the MOH, CAPM, and project preparation activities. If specific data on costs were unavailable, the individual costs of specific interventions were estimated through the analysis of fixed and variable costs that currently borne out by the national health system and social insurance schemes.

Presented below is the basic package of health interventions that consists of essential public health program (PHP) and minimum clinical services (CS) based on cost-effective analyses. The cost-effectiveness of each intervention is calculated against program alternatives--that is the cost and effect of outpatient care in the absence of public health program. For instance, for a fixed amount of resources, vaccination against measles and DPT would save 13 and 7 times more healthy life years, respectively, than would outpatient treatment. Thus, immunization services that have few acceptable private alternatives would have a particularly large payoff to the public. Implemented on a national basis, the package consisting (A) and (B) would reduce about 28 percent of burden of diseases in terms of DALY saved observed in 1993. Applying similar technique, a rough projection suggests that the combined package (A) and (B) would reduce the burden of disease by 43 percent in 2020.[7] The package (C) is the least cost-effective and rough calculation suggests that the DALY gains from interventions under (C) will vary from 10 to 15 percent but costs will be three times higher on average than the packages (A) and (B).

It is worth pointing out here that the basic health care package is based on DALY gains and the most cost-effective interventions, and can be adapted in each location to respond to province and local epidemiological conditions.

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[7] / For details see C.J.L Murray and A.D Lopez, "The Global Burden of Disease" Bulletin of the World Health Organization, 1990, 72 (3)

BASIC HEALTH PACKAGE

A. Essential Public Health

Public Health Education	
1) Children's and school health programs	0 Infectious and parasitic diseases, breastfeeding
2) Food hygiene	0 Food handling, preparation, disease transmission
3) Reproductive health	0 Family planning, sexually transmitted diseases
4) Nutritional education	0 Consumpion of fat, sugar and salt
5) Cancer	0 Breast, cervix, gastric, skin, prostate
6) Mental health	0 Depression
7) Accident prevention	0 Home, school, public areas, workplace
8) Prevention of addictions	0 Tobacco, alcohol, drugs
9) Control of vectors and zoonosis	0 Malaria, dengue, rabies, toxoplasmosis
10) Oral health	0 Buccodental hygiene
Public Health Outreach	
1) Water quality	0 Testing and monitoring of wells and tap water
2) Immunizations	0 Polio, DPT3, Measles, BCG,
3) Family planning	0 Distribution of FP devices
4) Prenatal, pregnancy and delivery care	0 Training and equipment for midwives
5) Sexually transmitted diseases	0 Condom distribution in risk groups
6) School health (5 - 15 years)	0 Ophthalmologic tests, Buccodental health
7) Well baby clinic (0 - 5 years)	0 Growth monitoring
8) Tuberculosis control	0 Supervised treatment
9) Strengthening of PHC infrastructure	0 Rehabilitation of PHC infrastructure
10) Training in PHC	0 Training of TAPS, Training of volunteer

B. Minimum Clinical Services

1) Reproductive health	0 Prenatal care 0 Delivery care 0 Treatment of imminent abortion 0 Family planning 0 Sexually transmitted diseases
2) Child health and school health	0 Acute respiratory diseases 0 Diarrhea 0 Rash and fever 0 Meningitis
3) Infactious diseases:	0 Tuberculosis 0 Intestinal infections 0 Parasitic diseases 0 Hepatitis 0 Geniot-urinary infections
4) Vector borne diseases:	0 Malaria 0 Dengue 0 Onchocercosis
5) Chronic diseases:	0 Hypertension 0 Diabetes 0 Asthma
6) Regular diagnostic consultation	0 Determination: healthy-sick
7) Limited treatment conditions:	0 AIDS 0 Pain management 0 Trauma
C. **Discretionary Clinical Services**	0 Acute abdominal condition
Treatment of	
1) Cancer	0 Chemotheraphy, Surgery
2) Cardiovascular diseases	0 Surgery, CAT scanning
3) Major Trauma	0 Grafting, surgery
4) Neurological disorder	0 Scanning, surgery
5) Psychiatric	0 Consultation, longer ib-patient stay

TECHNICAL ANNEX B

Table 1: Regression Estimates of Infant Mortality Rate

	Period	*log Income*	*log Health Expenditure*	*Safe water*	*Sani tation*	*DPT3*	*Adj R2*
OLS estimates							
China	1982-93	-0.688	0.249	-0.234	-0.154	0.134	0.55
		(-9.82)	(4.44)	(-4.17)	(-1.81)	(1.13)	
Malaysia	1986-89	-0.34		-0.107		-0.133	0.65
		(-0.27)		(-2.81)		(-5.54)	
Philippines	1982-90	-0.42	0.981	-0.963	-0.846	-0.324	0.49
		(-0.84)	(1.97)	(-4.39)	(-3.34)	(-2.17)	
Viet Nam	1986-90	-0.241	0.099	-0.266	-0.081	-0.982	0.78
		(-7.53)	(2.54)	(-4.09)	(-1.21)	(-3.18)	
Fixed effects							
China	1982-93	0.049	-0.114	0.052	-0.286	-0.259	0.96
		(1.28)	(-2.20)	(1.31)	(-3.40)	(-2.19)	
Malaysia	1986-89	-0.622		-0.102		-0.063	0.88
		(-0.11)		(-1.41)		(-2.11)	
Philippines	1982-90	-0.862	-0.233	-0.730	-0.748	-0.741	0.98
		(-6.96)	(-2.35)	(-1.72)	(-1.27)	(-2.81)	
Viet Nam	1986-90	-0.448	0.008	-0.082	-0.023	-0.415	0.97
		-4.48)	(0.42)	(-0.85)	(-0.56)	(-2.39)	
Random effects							
China	1982-93	-0.509	-0.531		-0.200	-0.242	0.21
		-6.97)	(-8.16)		(-0.83)	(-3.15)	
Malaysia	1986-89	0.45		-0.116		0.075	0.62
		(0.21)		(-2.32)		(3.75)	
Philippines	1982-90	-0.866	-0.205	-0.815	-0.89	-0.749	0.20
		(-7.03)	(-2.17)	(-1.93)	(-1.52)	(-2.84)	
Viet Nam	1986-90	-0.242	0.082	-0.214	-0.092	-0.687	0.81
		(-8.66)	(5.86)	(-8.56)	(-4.01)	(-6.19)	

Note: T-statistics are in the parentheses

(a) Although Hausman-Wu test shows fixed effect estimates better, estimated coefficients for Viet Nam are superior in random effects model than in any other models.(b) see Hammer (1992): "Malaysia: Fiscal Reform for Stable Growth" (10120-MA) for Malaysian data (c) Similar regressions on life expectancy at birth are not presented as the central message remains the same

Table 2: Regression Estimates of the Determinants of Infant Mortality (29 provinces 1982-92)

Right hand side variables	Fixed-effect Model	T-statistics
Per capita provincial Income	-0.448	-6.05
Sanitation	-0.270	-3.64
DPT3	-0.165	-1.91
Per capita provincial health expenditure	-0.564	-7.94
Interaction income x health expenditure	-0.190	-7.94
Adjusted R2	0.970	

Source: Staff calculations with data from MOH

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